APS Caribbean Division

Abstracts

October 1-5, 1995 Guadeloupe, French West Indies

Alphabetized by first author's last name

ARBUSCULAR MYCORRHIZAL FUNGI IN ALGINATE FILMS FOR PLANT INOCULATION AND *IN VIVO* OBSERVATION OF FUNGAL DEVELOPMENT. C. Calvet, A. Camprubí, and R. Rodríguez-Kábana, IRTA, Centre de Cabrils, E-08348 Cabrils, Barcelona, Spain, and Department of Plant Pathology, Auburn University, Auburn, AL 36849-5409.

Infective propagules of *Glomus mosseae* and *G. intraradices* were extracted from pot cultures by wet sieving and decanting. Extracts were homogenized in a blender and suspended in 2% (w/v) aqueous Na alginate. PVC-coated fiberglass screens (1.5 mm^2 mesh) were immersed in the propagule alginate suspension followed by dipping in 0.25M $CaCl_2$ to gel the alginate. Spores of both fungi were distributed uniformly in the films. Observation of the films after incubation at 25C for 4 days revealed 44±9% and 28±8% germination of *G. mosseae* and *G. intraradices* resting spores, respectively. In a greenhouse experiment, inoculation of 2-wk-old leek plants with the films resulted in good colonization of the roots by the fungi after 5 wk growth.

INTEGRATION OF SOIL SOLARIZATION INTO A HUMID, SUBTROPICAL CROPPING SYSTEM. D.O. Chellemi[1], S.M. Olson[1], D.J. Mitchell[2], R. McSorley[3] and I. Secker[4]. North Florida Research & Education Center[1], Plant Pathology Dept.[2], and Entomology and Nematology Dept.[3], University of Florida and Polyon-Barkai[4], Israel.

The effect of soil solarization on soilborne pests and yield was evaluated in a North Florida fresh market tomato production system. Strip solarization was performed on raised beds 1 m wide. Following solarization periods of 50 and 62 days, the plastic film was painted white and used as a mulch for the subsequent tomato crop. Soil solarization was performed alone or in combination with reduced rates of chemical fumigants, cabbage residue, photo-selective and gas impermeable plastic films. Soil temperatures under clear plastic ranged from 48.2 C at 10 cm depths to 39.4 at 25 C and were higher at the edges of plots, indicating that application of strip soil solarization on raised beds will negate the border effect. Populations of nutsedge (*Cyperus* spp.), and sting nematode (*Paratrichodorus minor*) were significantly ($P < 0.05$) reduced by solarization. No significant ($P < 0.05$) difference in marketable yield was detected between plots treated with soil solarization or methyl bromide.

SCREENING SUGARCANE GERMPLASM FOR RESISTANCE TO LEAF SCALD DISEASE BY ANALYSIS OF PATHOGEN POPULATIONS DENSITIES. J.H. Daugrois[1], Ibrahim Saeed Mohamed[2] and P. Rott[2]. Centre de coopération internationale en recherche agronomique pour le développement, CIRAD-CA, [1]Station de Roujol, 97170 Petit-Bourg, Guadeloupe, FWI, [2]BP5035, 34032 Montpellier cedex 1, France.

Cultivation of resistant varieties is the most effective means of controlling leaf scald disease of sugarcane caused by *Xanthomonas albilineans*. Screening sugarcane germplasm for resistance based solely on observation of symptoms following artificial inoculation can yield inconsistent results. A total of 45 clones of *Saccharum* spp. and *Erianthus arundinaceus* was evaluated for resistance to leaf scald based on pathogen population densities and symptom expression. One trial (15 clones) was conducted under greenhouse conditions and another (30 clones) was conducted in the field. Stalks were inoculated by the decapitation technique. The 3 *E. arundinaceus* clones did not exhibit any symptom of the disease, and pathogen populations were nil or low within the stalks. Severity of leaf scald symptoms among *S. spontaneum*, *S. sinense*, *S. robustum*, *S. barberi*, *S. officinarum* and interspecific hybrids of *Saccharum* varied according to the clones. High population densities of the pathogen were found in various locations of symptomatic stalks. However, numerous asymptomatic clones were also colonized by *X. albilineans*. Among the *Saccharum* genus, the clones exhibiting the highest resistance level belong to *S. spontaneum*, even if some clones of this species were rated as susceptible.

A WATERBORNE SPORE TRAP FOR EPIDEMIOLOGICAL STUDIES OF BANANA ANTHRACNOSE. L. de Lapeyre de Bellair. CIRAD-FLHOR–Station de Neufchâteau, Guadeloupe

Anthracnose is the main postharvest disease affecting bananas in the French West Indies. This disease is caused by *Colletotrichum musae* whose conidia form quiescent infections through appressoria. A large funnel, set under banana bunches and connected to a 5-l jerrycan, was used for epidemiological studies of this disease. All water-borne spores dispersed in rainwater runoff from the whole banana bunch were collected from flowering to harvest. *Colletotrichum* conidia were counted after staining with blue trypan and filtering through a 0.8 µm cellulosic membrane. Most conidia were collected from 25 to 40 days after bunch emergence, with a strong decline until harvest. Removal of the flower remnants and of the last bunch bract showed that *Colletotrichum* conidia are mainly produced on floral parts, but also on the last bunch bract. Where both sources were removed, very few inocula were detected during the whole trapping period. A primary inoculum would reach flower parts and the last bunch bract through rainsplash of conidia or aerial dissemination of ascospores, but this inoculum is not as important as the secondary inoculum developing on these secondary sources. Spore release was compared in a dry and a rainy area. Quantities of conidia trapped were similar in the two places, but spore concentration was higher in the drier area, thus indicating that more inoculum could remain on fruits from this area.

VARIABILITY OF ZUCCHINI YELLOW MOSAIC VIRUS IN MARTINIQUE AND PERSPECTIVES FOR CONTROL. C. Desbiez, C. Wipf-Scheibel and H. Lecoq. INRA, Station de Pathologie Végétale, BP 94, 84143 Montfavet Cedex, France.

Zucchini yellow mosaic potyvirus (ZYMV) was isolated in Martinique for the first time in 1992, and is now present on the entire island. Comparison of 14 isolates collected in 1992 and 1993 revealed an important biological and antigenic variability. In contrast, the molecular variability of the N-terminal part of the coat protein gene from the same isolates was low. This suggests that the virus was introduced on the island with a relatively narrow genetic base and that the rapid biological evolution was probably due to a limited number of mutations. Implications for defining durable control strategies will be discussed.

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GREENHOUSE SCREENING OF RHIZOBACTERIA FOR THE BIOCONTROL OF RHIZOCTONIA ROOT ROT OF COMMON BEAN. **Jorge Gómez Galué, R. Echávez-Badel, M. Alameda and E. C. Schroder. Departments of Crop Production and Agronomy & Soils, University of Puerto Rico, Mayaguez, P.R. 00681-5000.**

One hundred and seventy four rhizobacteria strains were preliminary screened under greenhouse conditions for the biocontrol of **Rhizoctonia solani** Khün (AG 1 isolate). Eight rhizobacteria strains (including UPR 5C) offered short-term protection against infection of seedlings of common bean (**Phaseolus vulgaris** L.) by **R. solani.** Significant differences (P=0.55) for root rot severity between rhizobacteria and control (fungus alone) were obtained at 10 days after bean planting. There were also significant differences between seeds treated with rhizobacteria and those treated with fungicide. Among eight, only five rhizobacteria strains increased the root fresh weight over control. This research was supported by contract G 93-06 of the Science and Technology Board, Economic Development Administration, Government of Puerto Rico.

BIOLOGICAL CONTROL OF BLACK SIGATOKA DISEASE (**MYCOSPHAERELLA FIJIENSIS**). R. González, E. Bustamante y P.J. Shannon. Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), Turrialba, Costa Rica.

The main control tactic for the control of Black Sigatoka in bananas is the use of fungicides. However the appearance of fungicide resistance, the lack of new products and the desire to reduce the high volume of pesticides use in this crop have combined to stimulate the search for alternatives. Since 1993, CATIE has been conducting research into biological control of Black Sigatoka in bananas and plantains. Laboratory, screenhouse and field trial shave shown that selected strains of **Bacillus cereus** y **Serratia marcescens** are effective control agents of this fungus. In the field, under conditions of severe disease pressure, there were no significant differences between the control given by fungicides and the microorganisms. At application rates of 10^7 cfu/ml, recovery of **S. marcescens** from leaf washings was 10^5 cfu/ml after 15 days. The best inoculum production was obtained in fermentations in nutrient broth.

UNCONVENTIONAL DISCOVERIES OF VECTORS: HISTORICAL REMINISCENCES. Karl Maramorosch, Rutgers University, New Brunswick, NJ 08903, USA.

Usually invertebrates associated with diseased hosts are the primary suspects in a search for vectors. Species feeding on diseased plants are identified, then tested for their ability to transmit the infectious agents. While many vectors have been detected by such conventional approaches, some have eluded detection and were finally found by unconventional means. The transmission of gemini viruses by whiteflies was discovered only after a glass cage was accidentally broken in Sao Paulo, Brazil. *Macropsis trimaculata* was determined as a vector of peach yellows phytoplasma in New York when adult hoppers were hiding behind tree trunks in early spring. Vectors of sugarcane mosaic virus were detected in Hawaii despite their inability to survive on sugarcane. The discovery of corn stunt spiroplasma and cadang-cadang viroid vectors are other examples of unconventional vector detection.

MONOSPORASCUS ROOT ROT/VINE DECLINE: AN EMERGING DISEASE OF MELONS. R. D. Martyn, M. E. Miller, B. R. Lovic, Y. J. Park, and J. S. Batten. Department of Plant Pathology and Microbiology, Texas A&M University, College Station, 77843 and Weslaco 78596.

Monosporascus cannonballus genus et species novus was erected in 1974 by Pollack and Uecker after observing specimens obtained from rotted cantaloupe roots in Arizona, but has received little attention from either mycologists or pathologists until recently. It is now known to cause a severe root rot/vine decline disease of muskmelon (*Cucumis melo*) and watermelon (*Citrullus lanatus*) in the southwestern United States, southern Spain, Israel, Tunisia, Taiwan, and Japan. *Monosporascus* appears uniquely adapted to hot, semi-arid, climates. It has an optimum *in vitro* growth temperature of 30-35C and can withstand high pH and salt. It is an ascomycete, but produces only one, large, spherical, jet-black ascospore per ascus. Ascospores do not germinate, or do so only rarely. There is no known asexual stage. Our laboratory has developed a PCR-based detection method for *Monosporascus* based on genus-specific primers within the ITS 1 and 2 regions of the rDNA. We also have described several double-stranded (ds) RNA genetic elements in some isolates that appear to be responsible for hypovirulence, culture degeneration and death. The dsRNAs are transmissible *via* hyphal anastomosis and have been observed in the ascospore. One isolate has been cured of its dsRNA and subsequently reverted to a wild-type, non-dsRNA phenotype. We are currently evaluating these dsRNAs as potential biocontrol agents of this fungus.

EFFECTS OF THRIPS FEEDING ON ONION BULB YIELD AND DEVELOPMENT OF PURPLE BLOTCH. M. E. Miller, Texas A&M University, Weslaco, TX 78596, B. Cartwright, C. L. McKenzie, and J. V. Edelson, Oklahoma State University, OK 74555.

The effects of thrips (*Thrips tabaci*) feeding on onion bulb yield and development of purple blotch (*Alternaria porri*) were determined on onion cv. Texas Grano 1015Y in field and greenhouse studies. In field studies, bulb yield was significantly ($p=0.05$) affected by purple blotch severity level and thrips population level. There was a significant interaction between purple blotch severity level and thrips population level on yield. In greenhouse studies, leaf area infected, number of lesions/leaf, area/lesion, and lesion length were significantly greater on onion plants with thrips than on plants without thrips. The intra-plant distribution of *A. porri* infection shifted to younger leaves as a result of thrips feeding damage.

CULTURAL MANAGEMENT OF SOILBORNE DISEASES IN THE HUMID TROPICS: AN OVERVIEW. **R.C. Ploetz, University of Florida, TREC, 18905 SW 280th Street, Homestead, FL 33031-3314.**

Soilborne diseases are ubiquitous constraints in production agriculture. Although chemical measures are often employed to manage these problems, diverse cultural methods are also available. These cultural practices encompass a very great number of approaches, including the: use of soil amendments, mulches, and various tillage practices; management of crop nutrition and soil moisture; avoidance or amelioration of host stress and predisposing factors; and use of clean seed and crop sanitation. All or some of these approaches lend themselves to use in any given situation, and many of the methods are as effective as the chemical measures that are used. Many approaches have long histories in traditional agriculture, whereas others have been more recently developed for use in modern agriculture. Successful examples in the humid tropics will be discussed, as will the basis and underlying principles for these practices, and the potential for their wider use during an era of reduced chemical alternatives.

SPATIAL AND TEMPORAL DISTRIBUTION IN SOILS OF *Cylindrocladium sp.* FUNGAL PATHOGEN OF BANANAS. J-M Risède, CIRAD-FLHOR Station de Neufchâteau, laboratoire de Phytopathologie, 97130 Capesterre Belle-Eau, Guadeloupe - FWI-.

Cylindrocladium sp. is a soilborne fungus that causes necrosis of roots and corm of bananas. Its biological cycle is yet underknown. In order to study its saprophytic phase, a process allowing a direct isolation and quantification of its propagules in soil samples was adapted. In a first step this process includes a combination of blending, washing and wet sieving techniques. In a second step, sieves contents (sand, organic particles and fungi propagules) are lightly disinfected with $CaClO_2$ before incorporation to an isolation medium made selective by addition of 100 ppm of TERGITOL NP 10 (nonyl phenyl polyethylene glycol ether with ethylene oxyde). It was shown that in banana fields inoculum densities of *Cylindrocladium* vary with soil type. They are high in light textured soils but low in vertisols. Study of the horizontal distribution of the fungus in banana fields revealed that inoculum densities are higher near the corms of banana trees than in the inter-rows. Analysis of soil samples coming from plots previously cultured with bananas and put after in fallow or cultured with other crops demonstrated that the fungus is able to persist in soils for many years in the absence of bananas. The role of its microsclerotia as survival units was pointed out.

EFFECTS OF CATIONS ON HATCHING OF *MELOIDOGYNE INCOGNITA* EGGS IN ALGINATE FILMS. R. Rodríguez-Kábana and N. Kokalis-Burelle, Department of Plant Pathology, Auburn University, Auburn, AL 36849-5409.

The effect of selected cations on *Meloidogyne incognita* egg hatching was studied using films prepared with an egg suspension in 3% (w/v) Na alginate. Fiberglass screens were dipped in the egg-alginate suspension and passed between glass rods to form a film 0.5mm thick. The coated screens were gelled by dipping for 10 sec in 5% (w/v) $CaCl_2$, $MnSO_4.H_2O$, $CuSO_4.5H_2O$, $FeCl_3.6H_2O$, $ZnSO_4.7H_2O$, $Fe(NH_4)_2(SO_4)_2.6H_2O$, or $FeSO_4.7H_2O$. The gelled screens were rinsed in demin water, placed in Petri dishes with 15 ml demin water, incubated at 27C, and after 24 hr the number of juveniles (J2) counted. Films gelled in Ca^{++} or Zn^{++} contained 6-7 times as many J2 as those gelled in FE^{+++}, and 3-5 times the number of J2 from screens gelled with the other cations.

EVALUATION OF FLUAZINAM 500 IN THE CONTROL OF SOIL BORNE AND FOLIAR DISEASES OF POTATOES (SOLANUM TUBEROSUM). J. Rugama[1], S. Hintz[2], L. Saenz[1] and M. Meyrat[1]. [1] Agrofuturo, Apartado A-265, Managua, Nicaragua and [2] ISK Biosciences, 2100 Ponce de Leon Blvd, Suite 1000, Coral Gables, FL 33134.

Potatoes are considered a basic food crop in many Latin American countries. Streptomyces scabies, Spongospora subterranea and Phytophthora infestans are some of the most damaging diseases affecting potato production in Central America. Fluazinam, a new multi-site fungicide of the pyridinamine group, was evaluated to determine its efficacy against these diseases. Research has demonstrated that fluazinam will provide excellent protectant activity against soil borne and foliar diseases of potatoes. Results from this trial show that fluazinam decreased disease infection and increased yields over the standard commercial treatments and the untreated check.

FIELD RESISTANCE OF MICRONESIAN TAROS TO PHYTOPHTHORA BLIGHT. E.E. Trujillo and T. Menezes. Department of Plant Pathology, University of Hawaii, 3190 Maile Way, Honolulu, HI 96822.

Taro leaf Blight (TLB) disease field-rating done at Hakalaua, Hawaii on taro cultivar collections from Palau, Guam and Rota, revealed high degrees of resistance to *Phytohthora colocasiae* among Palauan cultivars. All cultivars from Palau, Guam and Rota were significantly less susceptible to TLB than Niue the principal cultivar of American Samoa. Disease resistance in the majority of the Palauan cultivars appeared to be related to the high water-repellent characteristic of the foliage and to a hypersensitive reaction that caused infected leaf tissue to drop off, reducing leaf damage. Ten of 19 taro cultivars from Palau, were significantly more resistant than American Samoa and/or Hawaiian cultivars. Two cultivars were highly susceptible to *Pythium* sp. soft rot, and one to "guava seed". Plauan cultivars resistant to TLB are expected to produce well under American Samoa conditions and solve the shortage of taro supply caused by the recent introduction of TLB in the Samoan Is.

BREEDING MULTIPLE VIRUS AND INSECT RESISTANT CHILES FOR THE TROPICS. Benigno Villalón, Texas Agricultural Experiment Station, 2415 East Highway 83, Weslaco, Texas, 78596.

The increasing popularity of peppers has created an unprecedented demand for their production in the tropical and temperate regions. For years peppers have been threatened by a complex of viral diseases and their arthropod vectors. A breeding program was initiated in 1970 to develop multiple virus and insect resistant cultivars. Several genotypes possessing heritable resistance to isolates of tobacco etch virus, pepper mottle virus, cucumber mosaic virus, potato virus Y, tobacco mosaic virus and tobacco ringspot virus were identified. These stocks were hybridized with the best commercial cultivars of bells, long green/red chile, jalapeño, serrano, ancho, pimiento, cayenne, cherry and yellow wax pickling types. Approximately 1000 pepper breeding lines are evaluated per year for resistance to diseases, leafminer, pepper weevil, and whiteflies and tropical environmental stresses. The backcross method with screening at every generation has yielded eight new cultivars. Screening these lines for resistance to *Phytophthora capsici* was initiated in 1986. An efficient plant tissue culture regeneration system has been developed for several genotypes and plant transformation via *Agrobacterium tumefaciens* has been incorporated into the program.

THE EFFECT OF COMPOST AS A SOIL AMENDMENT ON PHYTOPHTHORA NICOTIANAE. T.L. Widmer[1], J.H. Graham[2], and D.J. Mitchell[1]. [1]University of Florida, Gainesville, FL 32611 and [2]Citrus Research and Education Center, Lake Alfred, FL 33850.

Phytophthora nicotianae causes a root rot on citrus. Fungicides control the disease and increase tree yields but are not always cost effective. Use of municipal solid waste (MSW) compost as a soil amendment for long-lasting control of Phytophthora root rot of citrus may be a viable alternative. Additions of MSW compost to soil (20% v/v) significantly reduced colony area of P. nicotianae, after the amended soil was plated on a selective medium (P=0.05). Likewise, aqueous extracts of the compost significantly reduced colony growth. A filamentous microorganism, isolated from another compost, parasitized hyphae of P. nicotianae. Based on susceptible citrus seedling assays under greenhouse conditions, addition of compost (20% v/v) to infested soil reduced disease incidence from 95% without compost to as little as 5% with some batches of compost.